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ABSTRACT

Free recall, cued recall, and clustering performance of fourth grade lower socioeconomic black and white children is studied under four conditions of teaching: random presentation, random presentation plus instruction, blocked presentation, and blocked presentation with instruction of categorically related list. Results indicate that both recall and clustering performance is enhanced by task structure in the form of blocked and blocked plus instruction presentation. Contrary to expectations, color differences in recall exist. The effect of blocking categorized items is especially facilitative for black children. Free recall is significantly better for black children who receive the categorized items contiguously than for black children who are presented the same items randomly. Caution is warranted when investigating cognitive development in lower SES children. Correlational analysis of the use of clustering during free recall reveal no significant relationships and seriously questions the use of an experimenter defined organizational strategy to assess level 2 ability as proposed by Jensen. Level 2 cognitive ability such as the recall of categorically related items can be used when teaching conditions encourage their use. Even then, however, a production deficiency may be present that does not permit a clear picture of the full extent of development. (Author/AM)

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EFFECTS OF ORGANIZATION AND INSTRUCTION ON FREE AND CUED RECALL IN LOWER SOCIOECONOMIC STATUS FOURTH GRADERS

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ABSTRACT

Free recall, cued recall and clustering performance of fourth grade lower socioeconomic Black and White children was studied under four teaching conditions. Conditions were random presentation, random presentation plus instruction, blocked presentation, and blocked presentation plus instruction of a categorically related list. Both recall and clustering performance was enhanced by task structure in the form of blocked and blocked plus instruction presentation. Correlational analysis of the use of clustering during free recall revealed no significant relationships and seriously questions the use of an experimenter defined organizational strategy to assess level 2 ability as proposed by Jensen.

Effects of Organization and Instruction on Free and Cued Recall in Lower Socioeconomic Status Fourth Graders

Concern for the influence of early developmental experiences on later cognitive development during childhood has been a prevalent research topic for both psychologists and educators during the last decade. The identification of groups of culturally different children on the basis of skin color, ethnic background, or socioeconomic status is relatively straight forward. However, there is less agreement in the research literature concerning the identification of the types of cognitive ability within a developmental level upon which the early experiences have an effect. One attempt (Jensen, 1969) has suggested that there are two broad classes of cognitive abilities called level one and level two abilities. According to Jensen (1970), level one ability is essentially rote memory that requires little if any elaboration, manipulation, or transformation of stimulus input in order to arrive at output. In contrast, level two processing ability requires the manipulation and transformation of stimulus input prior to making a response.

The aforementioned lack of agreement as to the type of cognitive ability influenced by early experience is best demonstrated by the different types of learning tasks that have been used to measure level one and level two ability. Jensen and Frederiksen (1973) as well as Mensing and Traxler (1973) used free recall of uncategorized and categorized lists to measure level one and level two processing respectively. More recently, Jensen and Figueroa (1975) have used forward and backward digit span as measures of level one and level two processing. Regardless of differences across studies in the use of tasks to measure cognitive abilities, a common feature has been the testing of Jensen's model (Jensen, 1969). In a recent response to the Joint Commission on Mental Health of Children (1970) report, Dusek (1973) called for psychologists to

stop comparing middle and lower class black and white childrens' performance only to conclude there is a developmental lag, but to study the nature of development and competencies in children. With that in mind, the present study was concerned with clarifying the effects of various teaching conditions on recall and clustering in both black and white lower socioeconomic status children.

The purpose of this experiment was to study lower socioeconomic status (SES) groups, both black and white, to determine what training methods optimize their learning in free recall tasks requiring level two processing. In addition to obtaining free recall and clustering data, a cued recall procedure was used following free recall of the categorized list. This procedure was employed in order to determine the presence of a mediation or production deficiency in the use of superordinate category labels during recall.

METHOD

Subjects A total of 120 lower SES children were selected at random from fourth grade classes in the Philidelphia Public School System. A constraint placed on the selection procedure was the exclusion of subjects who had repeated a grade. Sixty black and 60 white students were selected from the schools. Socioeconomic class was determined by the fact that over 85% of the children in each of the participating school districts were eligible to receive free lunch tickets. These tickets are given to a family of four if the annual income is less than $5310. The children within each color group were evenly divided by sex and were equally represented in all cells of the research design.

Procedure All subjects were presented with an initial list of 20 categorically unrelated items in order to obtain a baseline measure of free recall performance when a clustering strategy was precluded by task design. Following recall of the categorically unrelated list, subjects were randomly assigned to one of

five conditions. Twentyfour subjects (six male and six female black and an equal number of white children) were assigned to each group. One group served as a control group for warmup or practice effect. This group received a second categorically unrelated list of 20 items followed by free recall. The control group did not receive any further learning tasks.

Subjects in the four experimental teaching conditions received a second task that was a list of 20 categorically related items. This list consisted of five instances of four categories: vehicles, clothing, furniture, and animals. The four teaching conditions were random presentation, random presentation plus instruction, blocked presentation, and blocked presentation plus instruction. In the random presentation condition (RC), the list was presented in a predetermined random order with the limitation that no two items from the same category appear consecutively. In the random presentation plus instruction condition (RC+I), the order of the list was the same as in the RC condition with the following instructions. "In this set of pictures many of the pictures are alike or the same in some way. When you are trying to remember the pictures, you will do a better job if you remember how they are alike." In the blocked presentation condition (BC), the members of a category were presented contigously in the order of vehicles, clothing, furniture, and animals. In the blocked presentation plus instruction condition (BC+I), the items were presented in the same manner as in the BC condition with the same instructions as were given in the RC+I condition.

Following free recall of the categorized list, each subject was tested using a cued recall procedure. The cue was the category label: vehicle (something you go places in), clothing, furniture, or animals. The order in which the cues were presented was randomized across subjects. No time limits were imposed on recall in either the free or cued recall conditions.

The lists were presented only once with a four second interstimulus interval. Stimuli were black freehand drawings on 5 X 8 inch index cards. In order to determine if the pictures were recognized, subjects were asked to name each picture as they saw it presented. All items were easily recognized and only once did the experimenter need to provide a name.

RESULTS

Recall-control A simple one-way analysis of variance was used to analyze the categorically unrelated free recall data obtained from the initial list. This analysis was performed in order to check the comparability of the experimental groups and the control group on the initial learning task. No significant differences were found between the control group and the experimental groups F (4,115) = 1.27, $p > .05$.

The average recall scores for the control group decreased significantly ($p < .05$) from the first (mean = 8.6) to the second (mean = 6.9) list of unrelated items. Thus, any positive differences in the experimental conditions from list one to list two were attributed to the effects of treatment and not to warm-up or practice effect.

Recall-experimental conditions A 2(sex) X 2(color) x 4(presentation condition) X(recall scores) split-plot analysis of variance with repeated measures was used to analyze recall scores. The three dependent measures were free recall for the categorically unrelated items, free recall for the categorically related items and cued recall. Neuman-keuls tests for comparison between means were calculated on all means where a F value was significant.

The analysis indicated a significant main effect for presentation condition, F (3,80) = 4.69, $p < .005$. Free recall in the RC presentation condition was significantly poorer ($p < .01$) than in the RC+I, BC, or BC+I conditions. The main effect for color was also significant, F (1,80) = 6.68, $p < .01$. The

main effect for color was also contained in two significant higher order interactions. The sex by color interaction was significant, F (1,80) = 6.45, $p < .01$. White females recalled significantly ($p < .05$) more items than black females. Males of both color groups recalled an equivalent mean number of items. Though the males recalled less items than white females, the difference was not significant. The effects of sex, color, and presentation were contained in the significant three-way interaction, F (3,80) = 4.77, $p < .01$. As shown in figure 1, it was performance in the RC+I condition that contributed to this interaction. White females recalled significantly more ($p < .05$)

Insert Figure 1 about here

words than either white males or black females in the RC+I presentation condition. No other means within a presentation condition differed significantly.

The within main effect for recall was also significant, F (2,160) = 121.97, $p < .0001$. Significant differences ($p < .01$) in recall were found for free recall of unrelated items, categorically related items and cued recall. The average recall scores for the three tasks, respectively, were 7.96, 8.77, and 11.50 items. A significant interaction was found for presentation condition by recall scores, F (3,160) = 3.05, $p < .05$. The number of items recalled across the four presentation conditions was not significantly different when the task was free recall of unrelated items. When the task was changed, however, to either free recall of categorized items or cued recall, the recall scores were significantly ($p < .05$) lower when the items had been randomly organized (RC) during presentation. Additionally, the color by presentation condition by repeated measures interaction was significant, F (6,160) = 2.32, $p < .04$. As shown in figure 2, a significant difference ($p < .05$) in free recall for the RC and BC presentation of the categorically related items was found for blacks

but not for whites. Thus, grouping items categorically upon presentation significantly facilitated the number of items recalled by blacks.

Insert Figure 2 about here

Clustering The measure of clustering which was employed was developed by Roenker, Thompson, and Brown (1971); it is the adjusted ratio of clustering (ARC). This index was chosen because it adjusts for chance and has a fixed upper bound. Also, in instances where clustering is at a below chance level, a modification of the ARC measures can be made to yield negative ARC scores having the same properties as positive scores.

Clustering scores were analyzed using a 4(presentation condition) X 2 (color) X 2(sex) analysis of variance. Clustering scores were, of course, obtained from free recall performance on the categorically related items (task two). The only significant effect was for presentation condition, F (3,88) = 4.84, $p < .01$. While the BC and BC+I presentation conditions did not differ significantly, BC+I produced significantly ($p < .05$) more clustering than RC or RC+I. As can be noted from figure 3, blocked presentation facilitated clustering when compared to random presentation regardless of presence or absence of instruction to cluster.

Insert Figure 3 about here

Since recall of categorically related material has been used to assess level two ability, a post hoc correlational analysis was performed between free recall performance and clustering. There were no significant correlations between free recall and clustering when data were pooled or unpooled. For example, the highest order correlation was between free recall and clustering in the CR+I presentation condition, $r = .30$, $p < .14$. In this case, there is

only 9% common variance shared between free recall performance and the use of a clustering strategy which is commonly used experimentally to demonstrate memory processing.

DISCUSSION

Regardless of the fact that clustering was not used extensively, it's use was enhanced by the presence of blocking and instruction. Moreover, no significant difference was found between black and white lower SES fourth graders. However, questions must be raised concerning the use of clustering indexes as a measure of level two processing with this population. An experimenter defined organizational strategy such as clustering which is based on intracategory repetitions does not appear to describe memory processes used since it accounts for so little variance in free recall performance. Obviously, with the subjects employed in the present study, some type of subjective organization was being used to improve recall performance that could not be accounted for by a clustering strategy. It is not concern for the statistical model used to measure clustering that is the issue. The concern is one raised by Shuell (1975) involving the psychometric adequacy of measures designed to measure various psychological constructs. Of the criteria specified as necessary in order to evaluate psychometric adequacy, the use of a clustering strategy in assessing level two processing appears to lack empirical validity. To quote Shuell (pp. 722-723) "the measure must have empirical validity, defined as 'the degree of association between the measurement and some other observable measurement' (Lord & Novick, 1968, p.261)."

Contrary to expectations, color differences in recall did exist. However, of interest in the present study was the effect of mode of presentation on free and cued recall performance. The number of items freely recalled was greater for categorized items than uncategorized items. This was particularly

true when the teaching conditions of blocking or instructions were used in the presentation of categorized items. The use of instructions with a random presentation (RC+I), a blocked presentation (BC), or blocked presentation with instruction (BC+I) produced greater free recall of categorized items than a random presentation (RC). The effect of blocking categorized items was especially facilitative for black children. Free recall was significantly better for black children who received the categorized items contiguously, than for black children who were presented the same items randomly.

Cued recall performance which was superior to free recall of categorically related tiems indicated the ability to use superordinate category labels in order to aid memory. Cued recall produced significantly more recall of categorized items than free recall in all four treatment conditions. In cued recall, performance was again better for the RC+I, BC, and BC+I teaching conditions than for random presentation (RC). Additionally, in cued recall, there were no significant differences within a treatment condition between black and white children.

The ability to use category labels in cued recall in order to aid memory for categorized items would suggest the presence of a production deficit in free recall for lower SES in general and for black children in particular. A production deficit (Flavell, Beach, & Chinsky, 1966) is observed when there is a discrepancy between the potential availability and the actual use of a childs conceptual skills. In this case, a child does not spontaneously bring skills to bear on a task even when they are a part of his/her cognitive repertoire. A production deficiency is clearly different from a mediation deficiency as has been suggested (Jensen, 1969; Jensen & Frederiksen, 1973; Jensen & Figueroa, 1975). A mediation deficiency (Reese, 1962) would exist when a child in fact attempted to use a conceptual or symbolic skill and their use did not assist or mediate task performance in the expected way.

In summary, when investigating cognitive development in lower SES children, caution is warranted. Level two cognitive ability such as the recall of categorically related items can be used when teaching conditions encourage their use. Even then, however, a production deficiency may be present that does not permit a clear picture of the full extent of development.

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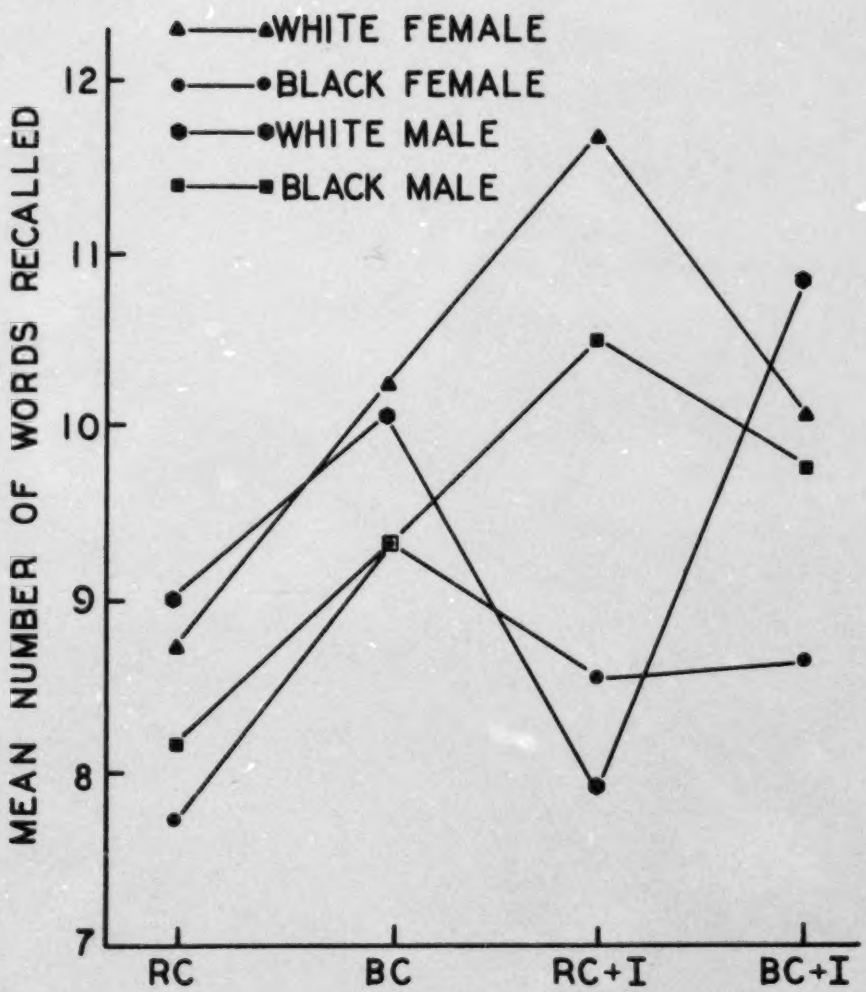
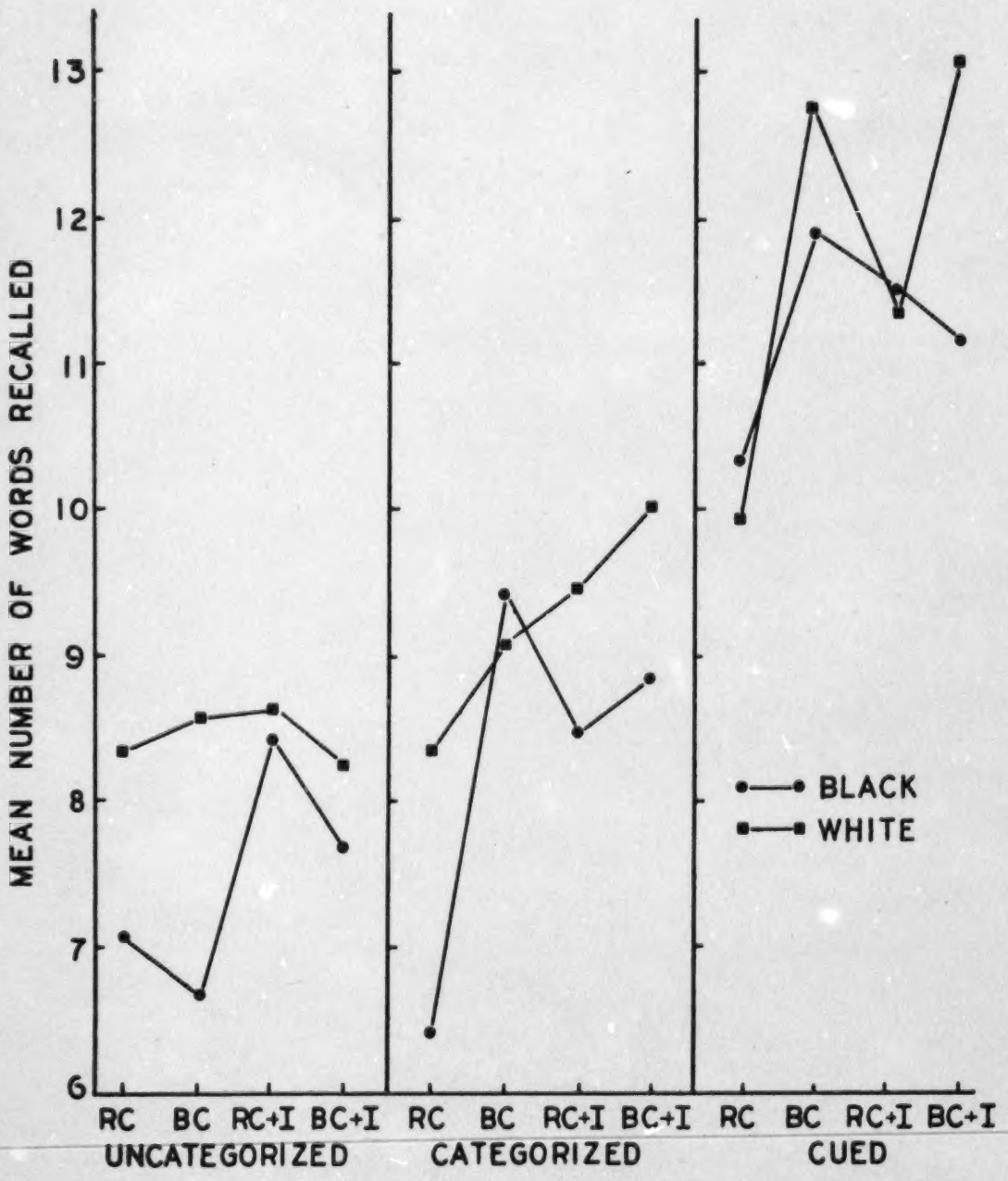
Figure Captions

Figure 1. Presentation condition by sex by color interation.

Figure 2. Presentation condition by color by repeated measures for recall performance.

Figure 3. Clustering scores: Main effects for the four teaching conditions.


WHITE FEMALE
BLACK FEMALE
WHITE MALE
BLACK MALE
MEAN NUMBER OF WORDS RECALLED
12
11
10
9
8
7
RC
BC
RC+I
BC+I
PRESENTATION CONDITION


MEAN NUMBER OF WORDS RECALLED
13
12
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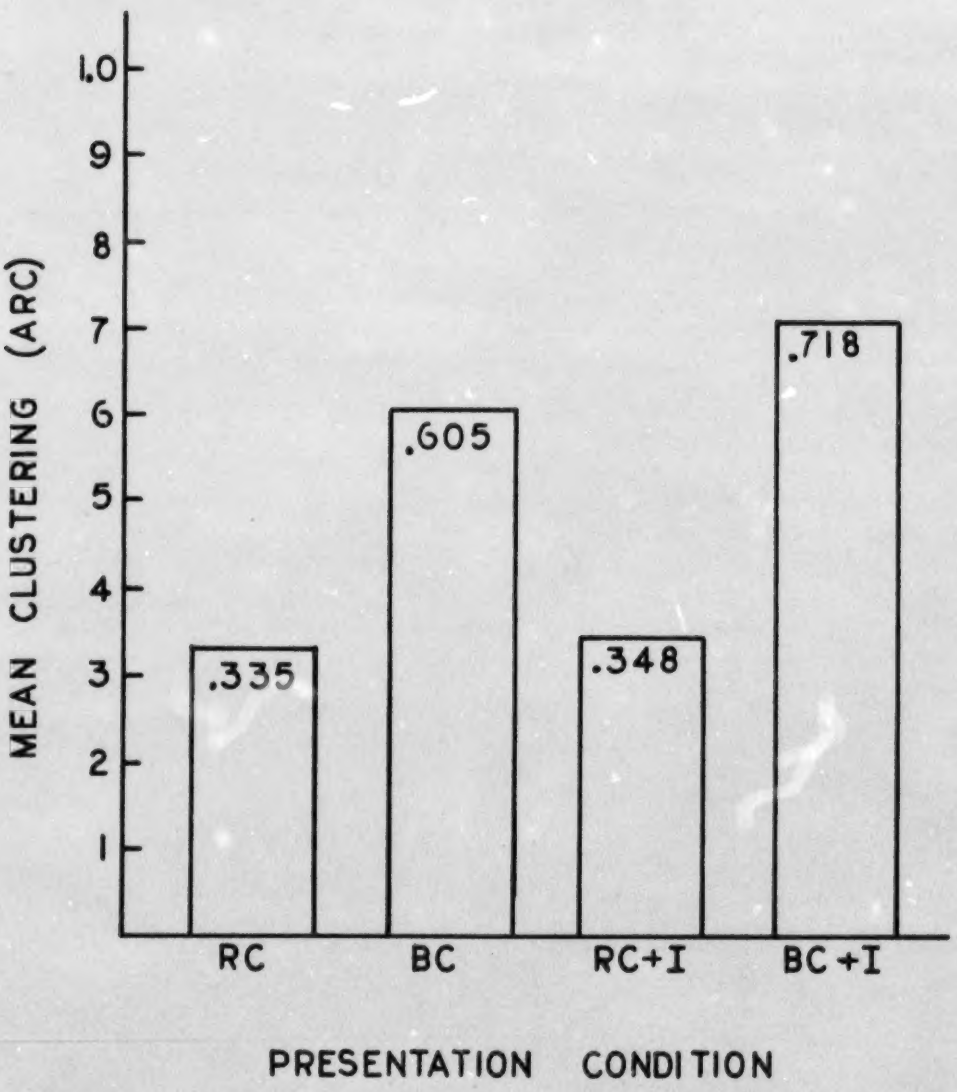
6
RC BC RC+I BC+I RC BC RC+I BC+I RC BC RC+I BC+I
UNCATEGORIZED
CATEGORIZED
CUED
BLACK
WHITE
REPEATED MEASURES FOR RECALL


MEAN CLUSTERING (ARC)
1.0
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8
7
6
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4
3
2
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.335
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.348
.718
RC
BC
RC+I
BC +I
PRESENTATION CONDITION